CLAIMS

What is claimed is:

1. An integrated semiconductor device comprising:

a semiconductor substrate;

a laser on the substrate having an active layer and a grating that form a laser cavity emitting light at a wavelength determined by the grating;

a modulator on the substrate having an active layer guiding the light from the laser;

an implantation region electrically isolating the laser and the modulator, the implantation region extending to a depth above the grating without reaching the active layer.

2. The semiconductor device of Claim 1 further comprising a laser contact for applying a forward bias to the laser and a modulator contact for applying a negative bias to the modulator to modulate the guided light.

3. The semiconductor device of Claim 1 wherein the active layer of the laser and the active layer of the modulator comprise a continuous layer.

4. The semiconductor device of Claim 1 further comprising a stop etch layer at a distance above the active layer that provides an index step of about 0.015 or less.

5. The semiconductor device of Claim 1 wherein the active layer of the laser and the active layer of the modulator comprise a continuous waveguide layer that is angled with respect to a front facet of the semiconductor device.

6. The semiconductor device of Claim 5 wherein the waveguide angle with respect to the front facet is greater than 5°.

7. The semiconductor device of Claim 6 wherein the waveguide angle with respect to the front facet is about 7°.

8. The semiconductor device of Claim 1 wherein the active layer of the laser and the active layer of the modulator comprise a continuous waveguide layer that is angled with respect to an etch defined at the intersection of the laser and the modulator.

9. The semiconductor device of Claim 8 wherein the waveguide angle with respect to the etch is greater than 5°.

10. The semiconductor device of Claim 9 wherein the waveguide angle with respect to the etch is about 7°.

11. The semiconductor device of Claim 1 further comprising an amplifier region between the laser and the modulator and wherein the implantation region electrically isolates the laser and amplifier from the modulator.

12. The semiconductor device of Claim 11 further comprising a stop etch layer at a distance above the active layer that provides an index step of about 0.015 or less.

13. The semiconductor device of Claim 11 wherein the active layers of the laser, amplifier and the modulator comprise a continuous waveguide layer that is angled with respect to a front facet of the semiconductor device.

14. The semiconductor device of Claim 13 wherein the waveguide angle with respect to the front facet is greater than 5°.

15. The semiconductor device of Claim 14 wherein the waveguide angle with respect to the front facet is about 7°.

16. The semiconductor device of Claim 11 wherein the active layers of the laser, amplifier and the modulator comprise a continuous waveguide layer that is angled with respect to an etch defined at the intersection of the laser or amplifier and the modulator.

17. The semiconductor device of Claim 16 wherein the waveguide angle with respect to the etch is greater than 5°.

18. The semiconductor device of Claim 17 wherein the waveguide angle with respect to the etch is about 7°.

19. The semiconductor device of Claim 1 further comprising an amplifier region on the semiconductor substrate and a second implantation region that electrically isolates the amplifier from the modulator.

20. The semiconductor device of Claim 19 further comprising a stop etch layer at a distance above the active layer that provides an index step of about 0.015 or less.

21. The semiconductor device of Claim 19 wherein the active layers of the laser, amplifier and the modulator comprise a continuous waveguide layer that is angled with respect to a front facet of the semiconductor device.

22. The semiconductor device of Claim 21 wherein the waveguide angle with respect to the front facet is greater than 5°.

23. The semiconductor device of Claim 22 wherein the waveguide angle with respect to the front facet is about 7°.

24. The semiconductor device of Claim 19 wherein the active layers of the laser, amplifier and the modulator comprise a continuous waveguide layer that is angled with respect to an etch defined at the intersection of the laser or amplifier and the modulator.

25. The semiconductor device of Claim 24 wherein the waveguide angle with respect to the etch is greater than 5°.

26. The semiconductor device of Claim 25 wherein the waveguide angle with respect to the etch is about 7°.

27. An integrated semiconductor device comprising:

a semiconductor substrate;

a laser on the substrate having an active layer and a grating that form a laser cavity emitting light at a wavelength determined by the grating;

a modulator on the substrate having an active layer guiding the light from the laser;

wherein the active layer of the laser and the active layer of the modulator comprise a continuous waveguide layer that is angled with respect to a front facet of the semiconductor device.

28. The semiconductor device of Claim 27 wherein the waveguide angle with respect to the front facet is greater than 5°.

29. The semiconductor device of Claim 28 wherein the waveguide angle with respect to the front facet is about 7°.

30. The semiconductor device of Claim 27 wherein the continuous waveguide layer is angled with respect to an etch defined at the intersection of the laser and the modulator.

31. The semiconductor device of Claim 30 wherein the waveguide angle with respect to the etch is greater than 5°.

32. The semiconductor device of Claim 31 wherein the waveguide angle with respect to the etch is about 7°.

33. The semiconductor device of Claim 27 wherein the active layer comprises AlInGaAs.

34. The semiconductor device of Claim 27 wherein the grating is a complex coupled Bragg grating.

35. The semiconductor device of Claim 27 further comprising a stop etch layer at a distance above the active layer that provides an index step of about 0.015 or less.

36. A method of fabricating an integrated semiconductor device comprising:

forming on a semiconductor substrate an active layer and a grating that form a laser cavity emitting light at a wavelength determined by the grating;

forming on the semiconductor substrate an active layer of a modulator guiding the light from the laser cavity; and

forming an implantation region to a depth above the grating without reaching the active layer to electrically isolate the laser cavity and the modulator.

37. The method of Claim 36 further comprising forming a stop etch layer at a distance above the active layer that provides an index step of about 0.015 or less.

38. The method of Claim 36 wherein the active layer of the laser cavity and the active layer of the modulator comprise a continuous waveguide layer that is angled with respect to a front facet of the semiconductor device.

39. The method of Claim 38 wherein the waveguide angle with respect to the front facet is greater than 5°.

40. The method of Claim 39 wherein the waveguide angle with respect to the front facet is about 7°.

41. The method of Claim 36 further comprising forming an amplifier region between the laser and the modulator.